page 15, line 28: change "foils" to –films– and "what" to –would–;

line 32: change "ration" to –ratio–;

page 16: line 1: change "foils" to –films– and "having" to –provided with--;

page 17: cancel; and

page 22: cancel lines 1 - 11 and substitute therefor ABSTRACT OF THE DISCLOSURE.

A method of an system for improving the strength of connection between a carrier substrate and a cover layer by obliquely bombarding the substrate at least one of its surfaces with heavy ion irradiation from two different angles to produce intersecting ion traces therein which by subsequent chemical etching are formed into intersecting recesses wherein a precipitated cover layer may be anchored.

In the claims:

Cancel claims 11 - 19 and add the claims appended hereto.

Remarks.

In view of the numerous editorial changes to his specification, Applicant is submitting, for the Examiner's convenience, a substitute specification in two versions. None of the changes proposed result in new matter being added to Applicant's original disclosure.

The objection under point 1 of the Office Action is believed to have been avoided by the enclosed new set of twenty claims as they no longer refer to any fractal dimensions.

The new claims are thought also to avoid the formal objections under points 2 to 4.

Having regard to the objection (points 5 and 6 of the Office Action) under 35 U.S.C. 103, Applicant believes, with respect, that the Examiner may not have understood his invention. For neither US patent 4,364,792 nor US patent 6,015,976 discloses matter which can reasonably be said to disclose, singly or in combination, anything from which a skilled artisan can derive the

kind of knowledge which would without inventive ingenuity enable him to practice the instant invention. Applicant was not only aware of the teachings of the '792 reference at the time the parent of his instant U.S. application was filed, but he discussed them in the introductory portion of his specification in connection with its German equivalent DE 2,916,006. Yet in the Examiner's opinion, the instant invention is rendered obvious by '792 in combination with '976. The former, it will *arguendo* be admitted, discloses a method of producing a metal layer attached to a plastic substrate in which the surface is subjected to heavy ion irradiation followed by etching for forming, in the surface, recesses defined in terms of size, shape and number into which a metal layer is penetrating. Size, shape and number of the recesses is a function of the setting an irradiation medium, its duration and intensity as well as influx angle of the rays, and of the subsequent etching operation. '976 even mentions the advantage of oblique impinging irradiation. The latter discloses, in Figs. 71 and 73 undercut and intersecting recesses.

The Examiner appears, however, to have overlooked the fact that '976 relates to the production of *micro* structures using different kinds of irradiation, including ion irradiation. It involves processing principles wholly different from those of Applicant's invention. The processes disclosed by '796 relate to direct removal of material by extended intensive irradiation. For producing a certain surface structure a beam of rays is structured and shaped by a mask such that the irradiation pattern penetrating through the mask impinges upon the material in a spatially structured manner and brings about the desired removal of material in a particle-by-particle manner, as it were. Accordingly, '976 relates to a direct processing technique by irradiation for working a predetermined actual structure into the material. There is no subsequent chemical etching following the irradiation. The intensity of the radiation used in the '976 patent is many time stronger than the radiation needed for practicing Applicant's invention. Unlike with Application's invention, it is not possible to make use of the '976 technology for producing structures in the nanometer range. At the time the '976 disclosure was filed it was not possible to manufacture masks having 1*10 EXP 7 to 5*10 EXP 8

holes per cm EXP 2. Even today, such masks can be produced only by exceedingly complex technology at commensurately excessive costs.

It will be appreciated that unlike the method disclosed by the '976 reference, in Applicants' invention every single heavy ion impinging, and interacting with, the carrier material represents an event of its own affecting the carrier material by generating a latent ion trace therein, and it is only by a subsequently performed chemical etching operation that material can be removed from the carrier, the aim being the generation of *nano* structures. Such a process cannot, of course, yield a surface having any kind of a regular structure. It results in a surface the structure of which is affected by the stochastically impinging heavy ions. Accordingly, while the prior art surface structure is concretely predefined, the structure resulting from the heavy ion bombardment in accordance with Applicant's invention is unpredictable and accidental, as it were. But it does lead to a sufficient number of intersecting recesses, some of which may be of conical shape, to provide the secure locking in place of a subsequently precipitated metal layer.

Having regard to the Examiner's allegation that the '792 reference discloses a process for roughening a surface by producing in the molecules near the surface, by heavy ion irradiation (col. 1, line 61), changes which in a subsequent etching process lead to the formation of exactly defined depressions (cavities) (col. 2, line 11 *seq.*), the Examiner's attention is respectfully directed to the paragraph beginning at line 32 on page 2 of Applicant's amended specification where the problems encountered with layers coated on such a surface are discussed . These problems are not overcome by the solution suggested by Figs. 71 and 73 of the '976 reference for reasons discussed above. One may well ask, however, given the age of the '792 reference (about twenty years at the time Applicant filed his German priority application), the awareness by industry of the problems relating to the undesirable separation of metal layers from dielectric substrates, and the considerable competition in this field, why the inventors of the '976 invention did not resort to the irradiation process taught by '792 and instead went the way of direct material removal by what can only be termed excessive and,

therefore, hazardous irradiation. The answer to this question is urged to be that those inventors while presumably aware of '792 and no doubt familiar with the engineering principle of undercut or intersecting recesses in a material providing excellent connecting or anchoring points for superposed layers but having, unlike the Examiner, no knowledge of Applicant's invention and, therefore, the benefit of hindsight analysis, did not consider it obvious to combine the teachings of the '792 and '976 references in a manner which would have resulted in something resembling what Applicant is proposing. Applicant's tests with structures of the kind disclosed by '792 have disclosed that whenever stable or strong connections between a polymer and a metal were sought, stripping tests proved satisfactory in dry conditions but invariably failed when the composites were exposed to higher levels of humidity or following submersion in water.

Yet even if the teachings of the '792 and '976 references were combined, the result would be something rather different from Applicant's invention. Such a combination would not lead to tubular recesses joined below the surface of the carrier material to form common chambers subsequently filled with in a looping manner by the metal of the precipitated cover layer. The prior art may be said to lead to connections resembling, *and functioning like*, a zipper which explains, of course, why under humid conditions the separate easily. In fact, the humidity may be said to act in the manner of a lubricant between the carrier and layer components. By contrast, Applicant's invention provides for a connection which may be likened to tightly interlocking rings which cannot be separated regardless of the level of ambient humidity.

If the Examiner deems a more detailed explanation of the manner in which the prior art device and a device made by practicing the instant invention function, Applicant would be pleased to provide it. Applicant's undersigned attorney would, if preferred, be prepared to discuss this matter with the Examiner in a personal interview at a mutually agreeable time. It is believed, however, that the above explanation suffices to demonstrate the very significant and patentable differences.

It is urged that the instant application as hereby amended is in condition for allowance which is courteously solicited.

Respectfully submitted,

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Enclosures